TITLE OF THE INVENTION

LINEAR COMPRESSOR

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of Korean Patent Application No. 2002-66098, filed October 29, 2002, in the Korean Intellectual Property Office, the disclosure of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0002] The present invention relates to a linear compressor, and more particularly, to a linear compressor to prevent collision between a compressing unit and an inner face of a casing, thereby improving reliability and a stability of the linear compressor.

2. Description of the Related Art

[0003] Referring to FIG. 4, a conventional linear compressor comprises an outer casing 105 which is closed, and a compressing unit 111 driven by a driving unit 131 to draw in, to compress and to discharge refrigerant within the outer casing 105.

[0004] The compressing unit 111 comprises a cylinder block 115 supporting a bottom of an outer core 137 of the driving unit 131 and forming a compressing chamber 113, a piston 121 installed to reciprocate within the compressing unit 113 and a cylinder head 123 provided on a bottom of the cylinder block 115 and having a valve part (not shown) formed with a suction valve (not shown) to draw in the refrigerant and a discharge valve (not shown) to discharge the refrigerant.

[0005] The driving unit 131 comprises an inner core 133 provided outside the cylinder block 115, an outer core 137 having a coil 135 wound in an annular manner, in an inside thereof and separated from a circumferential surface of the inner core 133 with a predetermined interval, a magnet 141 provided between the inner core 133 and the outer core 137, having a reciprocating motion through an electromagnetic interaction with magnetic fields from the inner core 133 and the outer core 137, and an inner core supporting unit 134, installed on the cylinder block 115 between the inner core 133 and the cylinder block 115, to support the inner core 133.

[0006] A stationary frame 145 and the cylinder block 115 supporting the outer core 137 are, respectively, mounted on a top and a bottom of the outer core 137.

[0007] A plurality of steel plates comprising the outer core 137 are stacked and the stacked steel plates engage with the stationary frame 145 and the cylinder block 115 by a plurality of bolts 143 to engage the outer core 137 and displaced remote from a circumferential face of the outer core 137 by a predetermined interval.

[0008] On a top of the piston 121 of the compressing unit 111 is mounted a movable unit 151, a portion of which supports the magnet 141 in a stationary manner, the magnet 141 being provided between the inner core 133 and the outer core 137 of the driving unit 131. The movable unit 151 is linked with a vertical reciprocating motion of the magnet 141, thereby allowing the piston 121 to vertically reciprocate within the compressing chamber 113.

[0009] Over the movable unit 151 and the stationary frame 145 is mounted a vibrating spring 153 to double a vertical reciprocating motion of the piston 121.

[0010] In this type of a conventional linear compressor, a lower part of the compressing unit 111 is supported by the outer casing 105 by supporting springs 108 disposed between a lower part of the cylinder block 115 and an inner bottom of the outer casing 105. However, because an upper part of the compressing unit 111 is free to move, a part of the compressing unit 111, that is, the stationary frame 145 or the vibrating spring 153, is collidable with an

inside wall of the outer casing 105 while the linear compressor is in operation, and due to the collision, the reliability and the stability of the linear compressor is lowered.

[0011] Further, the problem may be caused in a course of manufacture or a delivery of the conventional linear compressor.

SUMMARY OF THE INVENTION

[0012] Accordingly, it is an aspect of the present invention to provide a linear compressor to prevent a collision between a compressing unit and an inner face of a casing, thereby improving reliability and a stability of the linear compressor.

[0013] Additional aspects and/or advantages of the invention will be set forth in part in the description which follows and, in part, will be obvious form the description, or may be learned by practice of the invention.

[0014] The above and/or other aspects are achieved by providing a linear compressor comprising a casing, a driving unit provided within the casing, a compressing unit driven by the driving unit, compressing refrigerant, and a supporting spring elastically supporting the compressing unit, a projection projected on one of the compressing unit and a ceiling part of the casing, and a stopper provided in a remaining one thereof, movably accommodating the projection within a predetermined movable range.

[0015] According to an aspect, the compressing unit includes a cylinder block provided within the casing, forming a compressing chamber, a piston installed to reciprocate within the compressing chamber, a movable unit connected to the piston, reciprocating together with the piston, and a vibrating spring disposed over the movable unit, increasing the reciprocating motion of the piston and the movable unit.

[0016] According to an aspect, the linear compressor further comprises a supporting member combined with a top of the vibrating member, wherein the projection is projected

upward toward the inner ceiling part of the casing from a top of the supporting member and the stopper is provided in the inner ceiling part of the casing to accommodate the projection.

[0017] According to an aspect, the linear compressor comprises a supporting member combined with the top of the vibrating member, wherein the projection projects downward toward the supporting member from the inner ceiling part of the casing and the stopper is provided on the top of the supporting member to accommodate the projection.

[0018] According to an aspect, the supporting member comprises a combining part combined with the top of the vibrating member, radially extending downward from a center of the supporting member.

[0019] According to an aspect, an opening is formed in the projection along a vertical direction.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] These and/or other aspects and advantages of the present invention will become apparent and more readily appreciated from the following description of the embodiments, taken in conjunction with the accompany drawings of which:

[0021] FIG. 1 is a longitudinal sectional view of a linear compressor according to a first embodiment of the present invention;

[0022] FIG. 2 is a sectional view taken along line II-II of FIG. 1;

[0023] FIG. 3 a longitudinal sectional view of a linear compressor according to a second embodiment of the present invention; and

[0024] FIG. 4 is a longitudinal sectional view of a conventional linear compressor.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0025] Reference will now be made in detail to the embodiments of the present invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to like elements throughout. The embodiments are described below in order to explain the present invention by referring to the figures.

[0026] FIG. 1 is a longitudinal sectional view of a linear compressor according to a first embodiment of the present invention, and FIG. 2 is a sectional view taken along line II-II of FIG. 1. Referring to FIGS. 1 and 2, the linear compressor comprises an outer casing 5 which is closed, and a compressing unit 11 driven by a driving unit 31, drawing in, compressing and discharging refrigerant within the outer casing 5.

[0027] The compressing unit 11 includes a cylinder block 15 supporting a bottom of an outer core 37 of the driving unit 31 and forming a compressing chamber 13, a piston 21 installed so as to be able to reciprocate within the compressing chamber 13, and a cylinder head 23 having a valve part provided below the cylinder block 15, the valve part being formed with a suction valve (not shown) drawing in the refrigerant and a discharge valve (not shown) discharging the refrigerant.

[0028] The driving unit 31 comprises an inner core 33 provided outside the cylinder block 15, an outer core 37 having a coil 35 wound in an annular manner, in an inside thereof and separated from a circumferential surface of the inner core 33 with a predetermined interval, a magnet 41 provided between the inner core 33 and the outer core 37, having a reciprocating motion through an electromagnetic interaction with magnetic fields from the inner core 33 and the outer core 37, and an inner core supporting unit 34, installed on the cylinder block 15 between the inner core 33 and the cylinder block 15, to support the inner core 33.

[0029] A stationary frame 45 and the cylinder block 15 supporting the outer core 37 are, respectively, mounted on a top and a bottom of the outer core 37. A lower part of the compressing unit 11 is supported by the outer casing 5 by supporting springs 8 disposed between a lower part of the cylinder block 15 and an inner bottom of the outer casing 5.

[0030] A plurality of steel plates comprising the outer core 37 are stacked and the stacked steel plates engage with the stationary frame 45 and the cylinder block 15 by a plurality of bolts 43 to engage the outer core 37 and displaced remote from a circumferential face of the outer core 37, by a predetermined interval.

[0031] On a top of the piston 21 of the compressing unit 11 is mounted a movable unit 51, a portion of which supports the magnet 41 in a stationary manner, the magnet 41 being provided between the inner core 33 and the outer core 37 of the driving unit 31 while maintaining the predetermined interval. The movable unit 51 is linked with a vertical reciprocating motion of the magnet 41, thereby allowing the piston 21 to vertically reciprocate within the compressing chamber 13.

[0032] Over the movable unit 51 and the stationary frame 45 is mounted a plurality of vibrating springs 53 to double a vertical reciprocating motion of the piston 21, the vibrating springs 53 being stacked by bolts 57. Between the vibrating springs 53 are disposed spring spacers (not shown). The vibrating spring 53 and a top of the movable unit 51 are combined by a stationary shaft 59.

[0033] Between the vibrating springs 53 and an inner ceiling part on of the outer casing 5 is provided a supporting unit supporting the compressing unit 11 so as to prevent a collision between the compressing unit 11 and an inner wall of the outer casing 5.

[0034] The supporting unit comprises a supporting member 60 combined with a top of the vibrating springs 53, being formed with a projection 61, and a stopper 70 provided on the inner ceiling part of the outer casing 5, accommodating the projection 61 of the supporting member 60.

[0035] The supporting member 60 comprises the projection 61 and a plurality of (e.g., three) combining parts 63, the projection 61 projecting toward the inner ceiling part of the outer casing 5 from a middle top thereof and the combining part 63 radially extending around the projection 61, combining with the top of the vibrating springs 53 by a bolt 64.

[0036] The projection 61 is formed with an opening 62 produced by penetrating the projection 61 vertically. The stationary shaft 59 passes through the opening 62 when engaging the movable unit 51 and the vibrating springs 53 to facilitate an engagement operation.

[0037] The stopper 70 accommodating the projection 61 is positioned in the inner ceiling part of the outer casing 5 opposite to the projection 61. The stopper 70 may accommodate the projection 61, allowing the projection 61 to move within a predetermined range (indicated "a" in FIG. 1) since the bottom of the stopper 70 is opened downward so as to sufficiently accommodate the projection 61.

[0038] With this configuration, if power is applied to the coil 35 annually wound inside the outer core 37, magnetic flux originated from the application interacts with a magnetic field from the magnet 41 connected to the movable unit 51, to thereby reciprocate the piston 21 in a vertical manner. If the piston 21 reciprocates vertically, the refrigerant flowing into the compressing chamber 13 is compressed and then discharged into the discharge valve of the valve part. A compression and discharge process will be repeated, successively, until a capacity of cooling as needed is achieved. A larger driving force resulting from the vibration is acquirable by making a mass of the piston 21 and a number of proper vibration of the vibrating springs 53 have a value almost correspond to a frequency of power supplied.

[0039] The linear compressor is able to prevent damage due to a collision between the stationary frame 45 or the vibrating springs 53 of the compressing unit 11 and the inner wall of the outer casing 5 since the projection 61 of the supporting member 60 combined with the vibrating springs 53 is movably accommodated within the stopper 70 provided in the inner ceiling part of the outer casing 5, and a range that the top of the compressing unit is movable is limited to the predetermined movable range "a" due to a combination of the stopper 70 and the projection 61.

[0040] According to the above-described first embodiment of the present invention, a projection 61 is formed in the supporting member 60 and the stopper 70 is formed in the inner ceiling part of the outer casing 5, opposite to the projection 61, and the projection 61 of

the supporting member 60 is movably accommodated in the stopper 70 on the inner ceiling part of the outer casing 5. However, according to the second embodiment shown in FIG. 3, since a projection 80, projecting downward toward a supporting member 90, is formed in the inner ceiling part of the outer casing 5 and a stopper 91 accommodating the projection 80 is formed on a top of the supporting member 90, the projection 80 on the inner ceiling part of the outer casing 5 may limitedly move within the stopper 91 a predetermined amount.

[0041] As is described above, a linear compressor capable of preventing a collision between a compressing unit and an inner face of a casing is provided, thereby improving reliability and a stability of a product.

[0042] Although a few embodiments of the present invention have been shown and described, it will be appreciated by those skilled in the art that changes may be made in these embodiments without departing from the principles and spirit of the invention, the scope of which is defined in the appended claims and their equivalents.